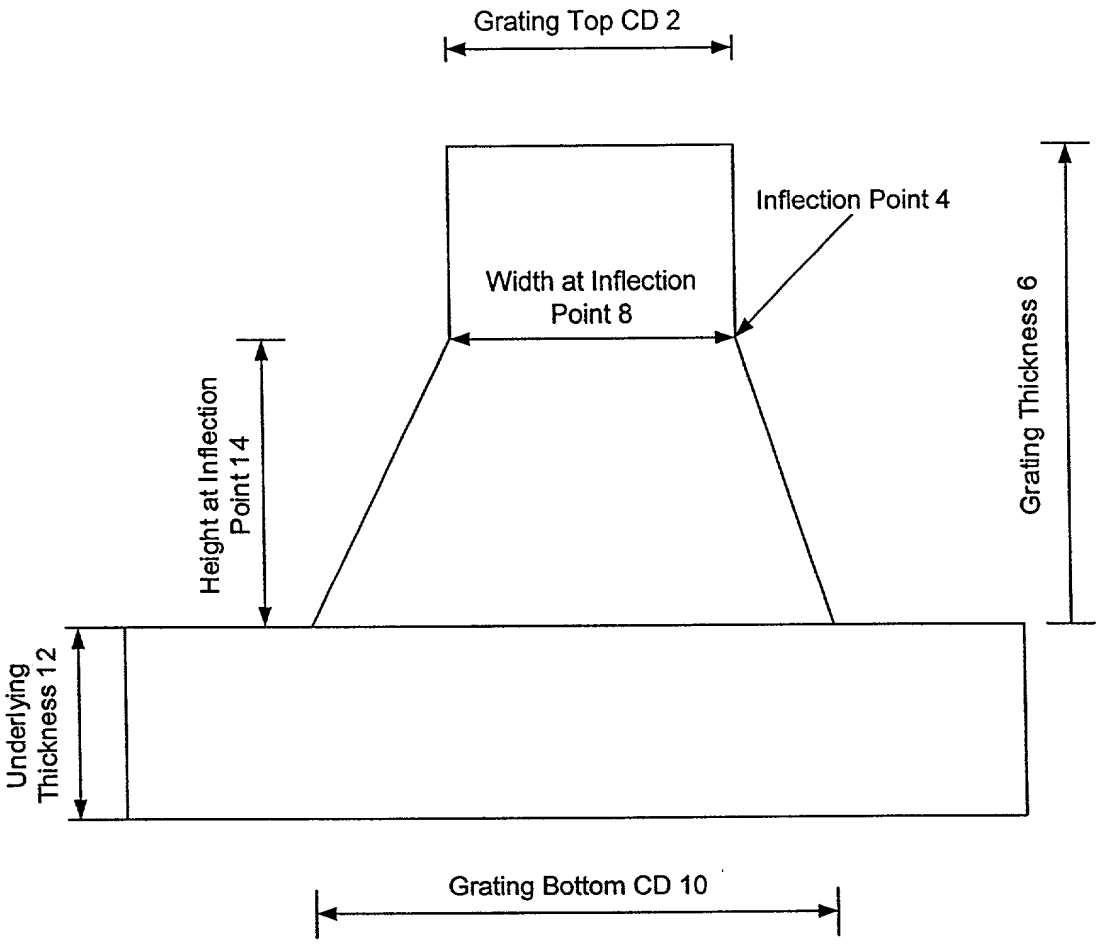
Grating Top CD 2
Inflection Point 4
Width at Inflection Point 8
Grating Thickness 6
Height at Inflection Point 14
Underlying Thickness 12
Grating Bottom CD 10

FIG. 1

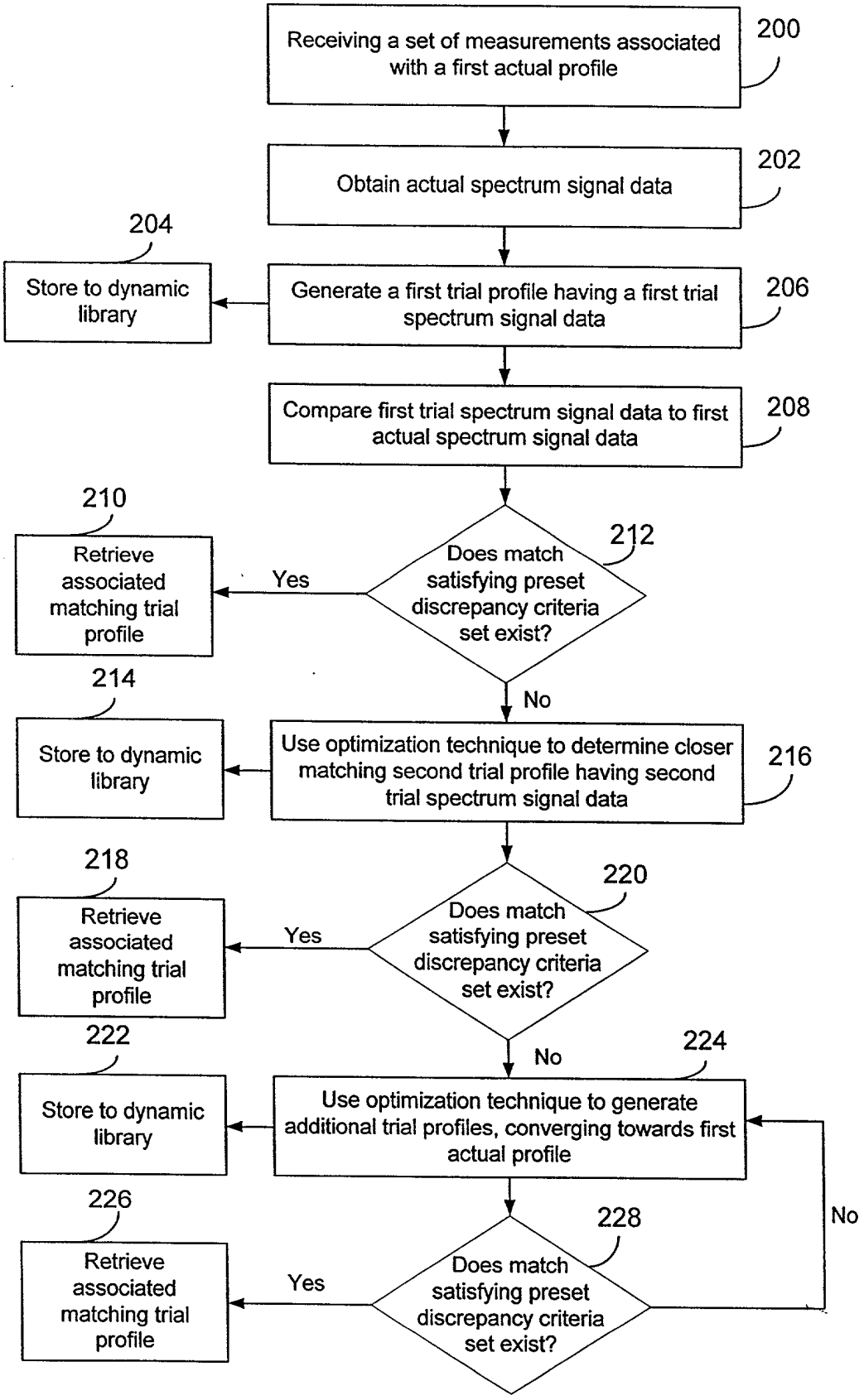
Receiving a set of measurements associated with a first actual profile
200
Obtain actual spectrum signal data
202
204
Store to dynamic library
Generate a first trial profile having a first trial spectrum signal data
206
Compare first trial spectrum signal data to first actual spectrum signal data
208
210
Retrieve associated matching trial profile
Yes
Does match satisfying preset discrepancy criteria set exist?
212
No
214
Store to dynamic library
Use optimization technique to determine closer matching second trial profile having second trial spectrum signal data
216
218
Retrieve associated matching trial profile
Yes
Does match satisfying preset discrepancy criteria set exist?
220
No
222
224
Store to dynamic library
Use optimization technique to generate additional trial profiles, converging towards first actual profile
226
Retrieve associated matching trial profile
Yes
Does match satisfying preset discrepancy criteria set exist?
228
No

FIG. 2

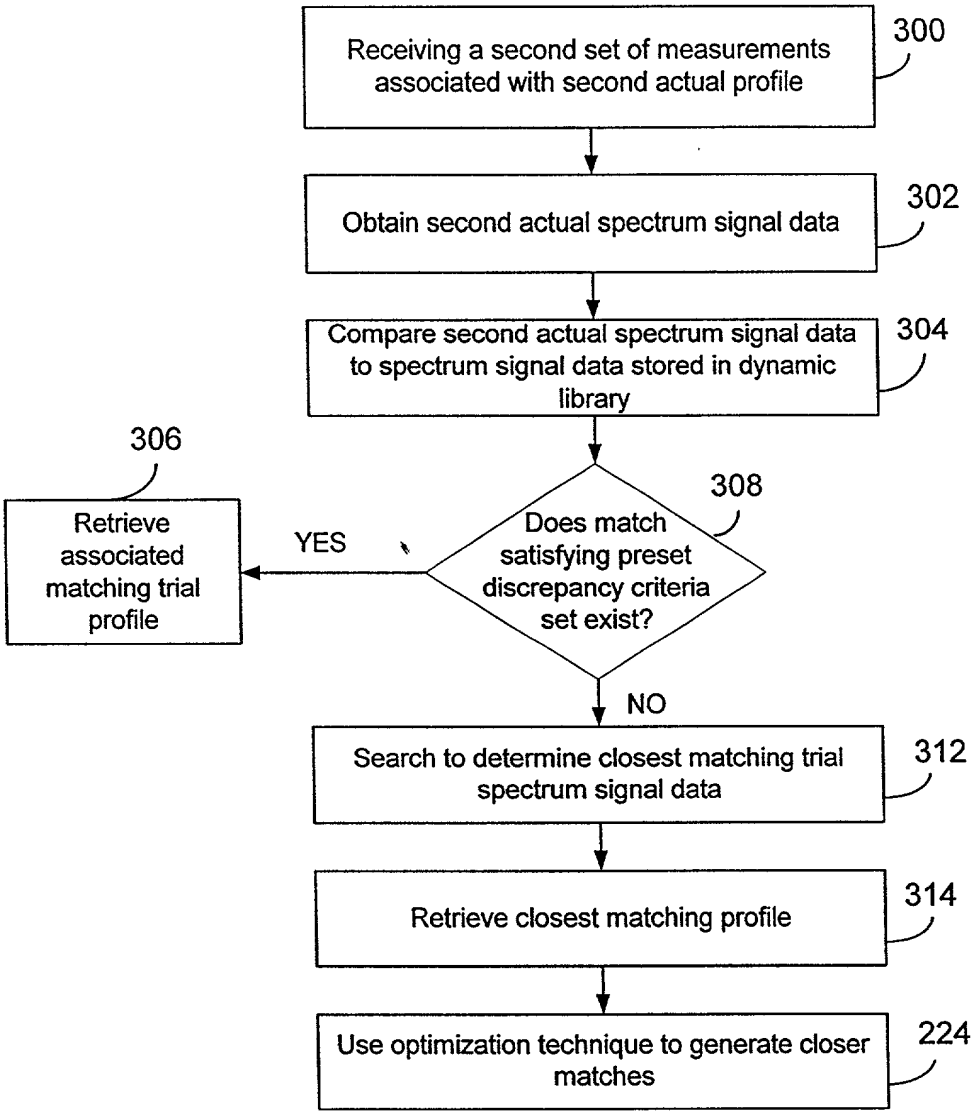
Receiving a second set of measurements associated with second actual profile
300
Obtain second actual spectrum signal data
302
Compare second actual spectrum signal data to spectrum signal data stored in dynamic library
304
306
Retrieve associated matching trial profile
YES
308
Does match satisfying preset discrepancy criteria set exist?
NO
Search to determine closest matching trial spectrum signal data
312
Retrieve closest matching profile
314
Use optimization technique to generate closer matches
224

FIG. 3

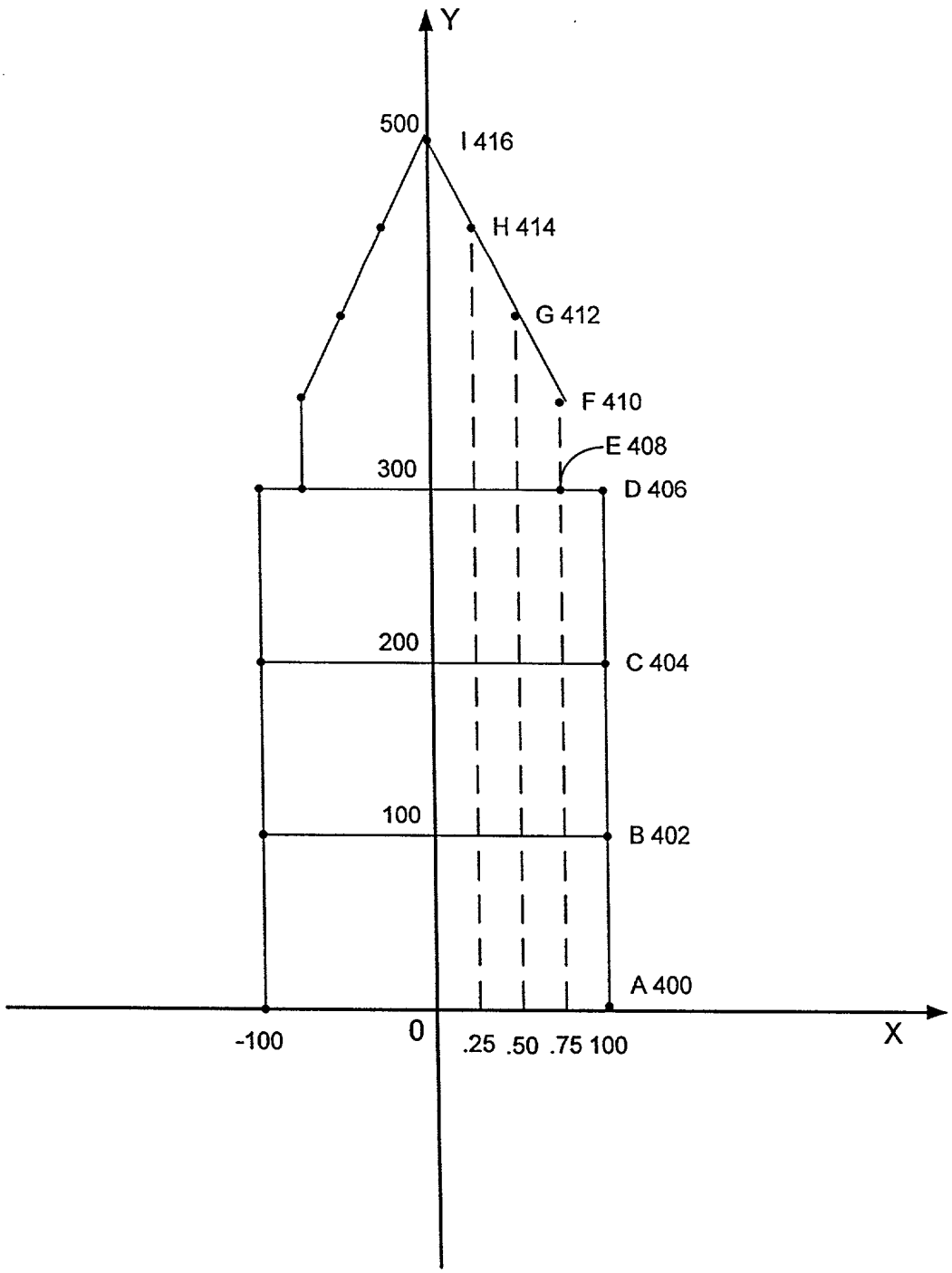
Y
500
I 416
H 414
G 412
F 410
E 408
300
D 406
200
C 404
100
B 402
A 400
-100
0
.25 .50 .75 100
X

FIG. 4

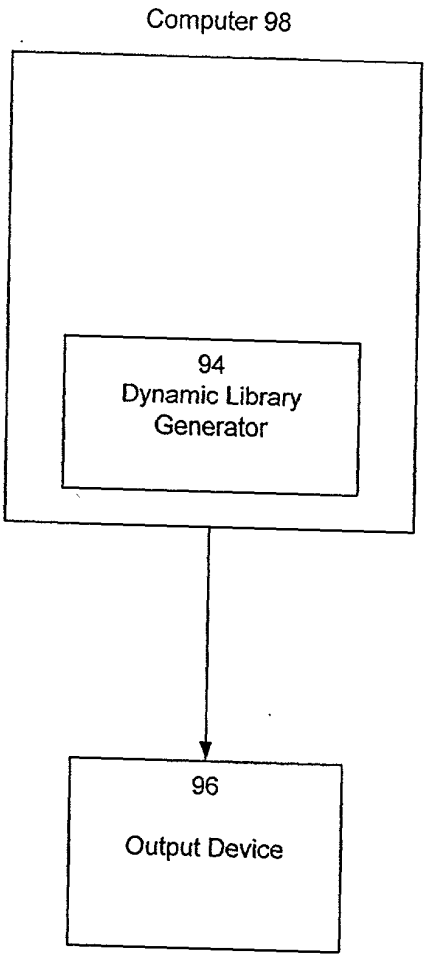

FIG. 5

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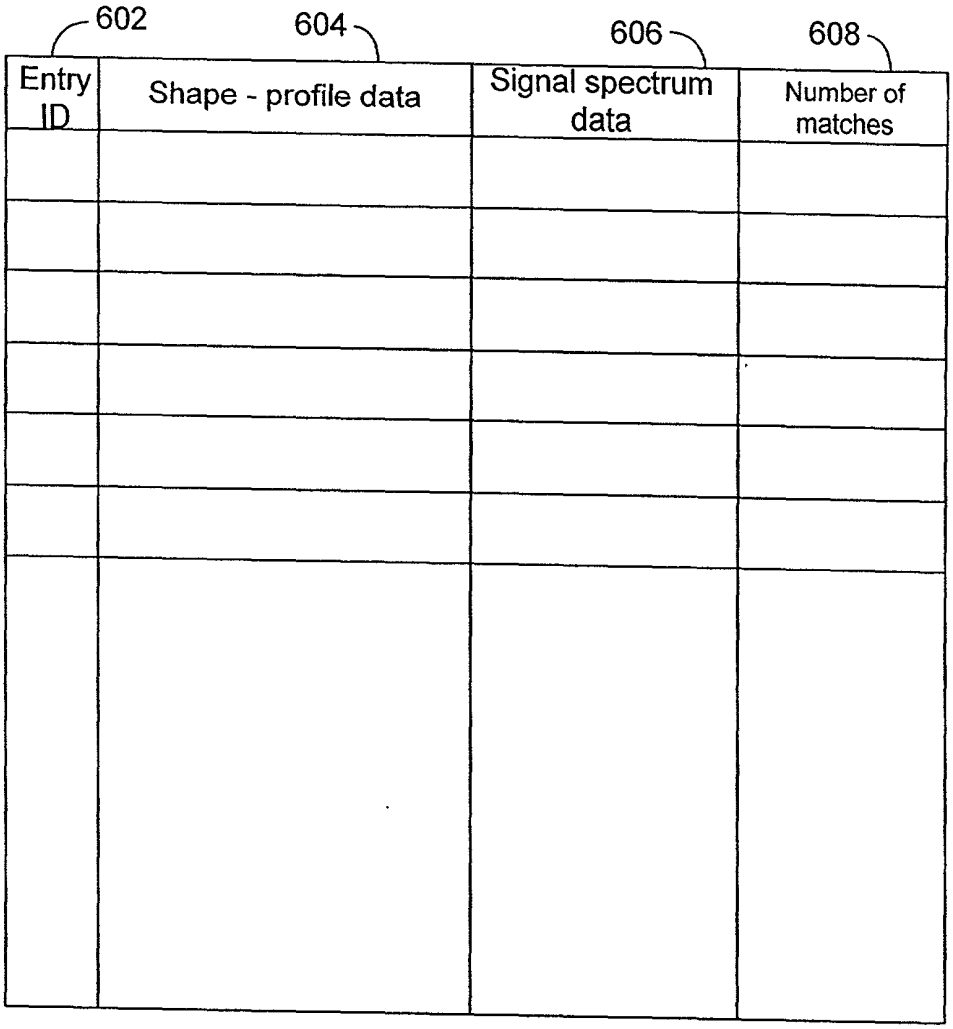
602
604
606
608
Entry ID
Shape - profile data
Signal spectrum data
Number of matches
600

FIG. 6

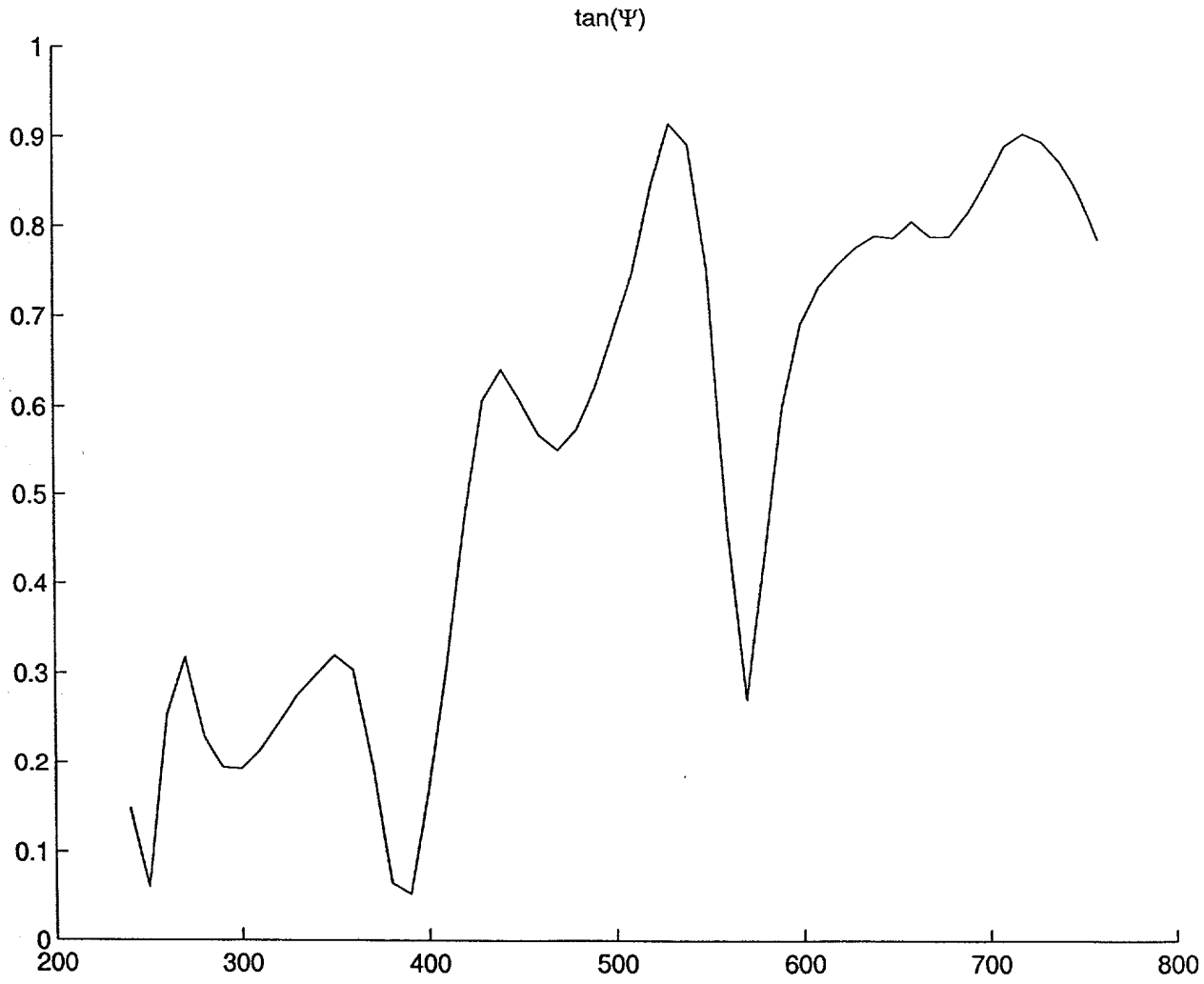

FIG. 7

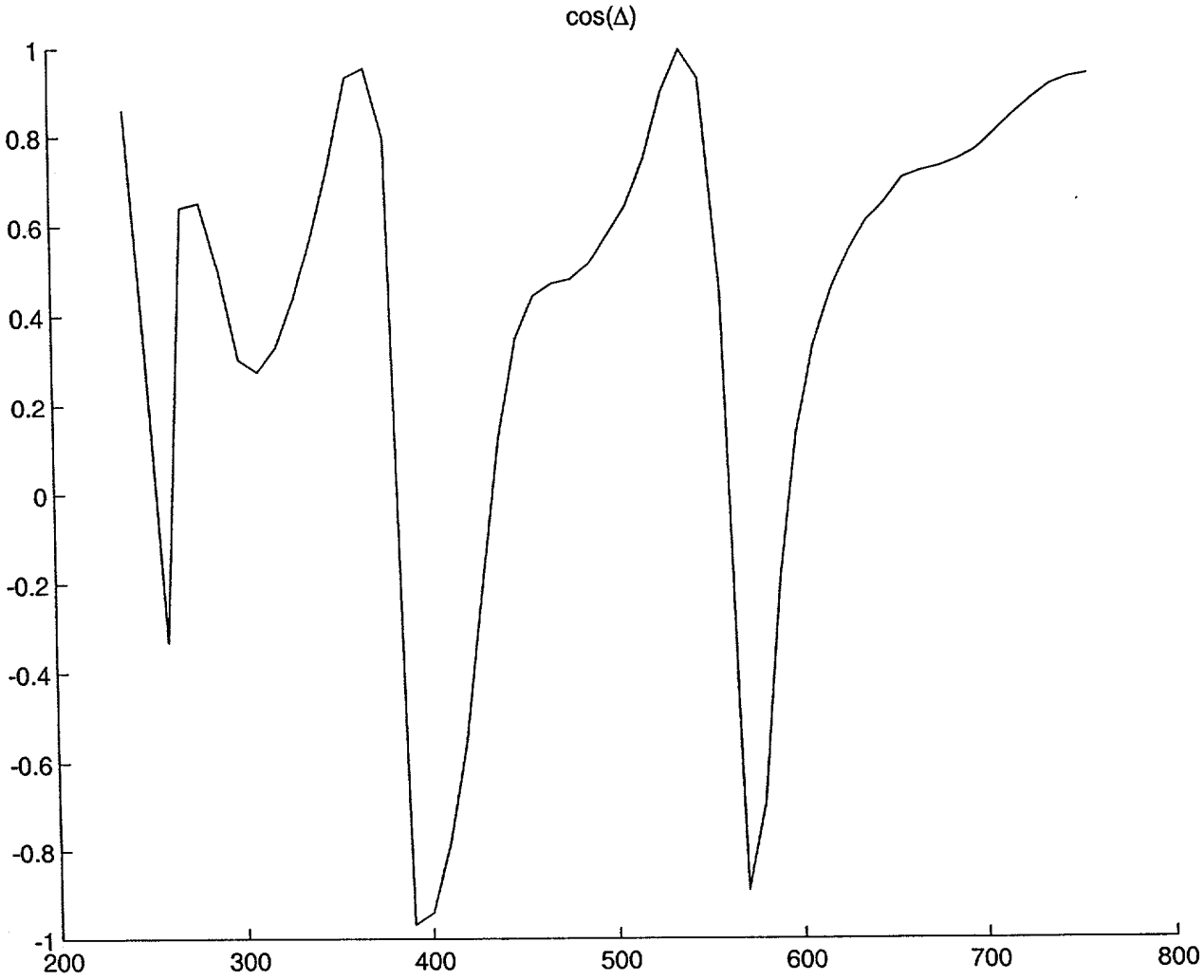

FIG. 8

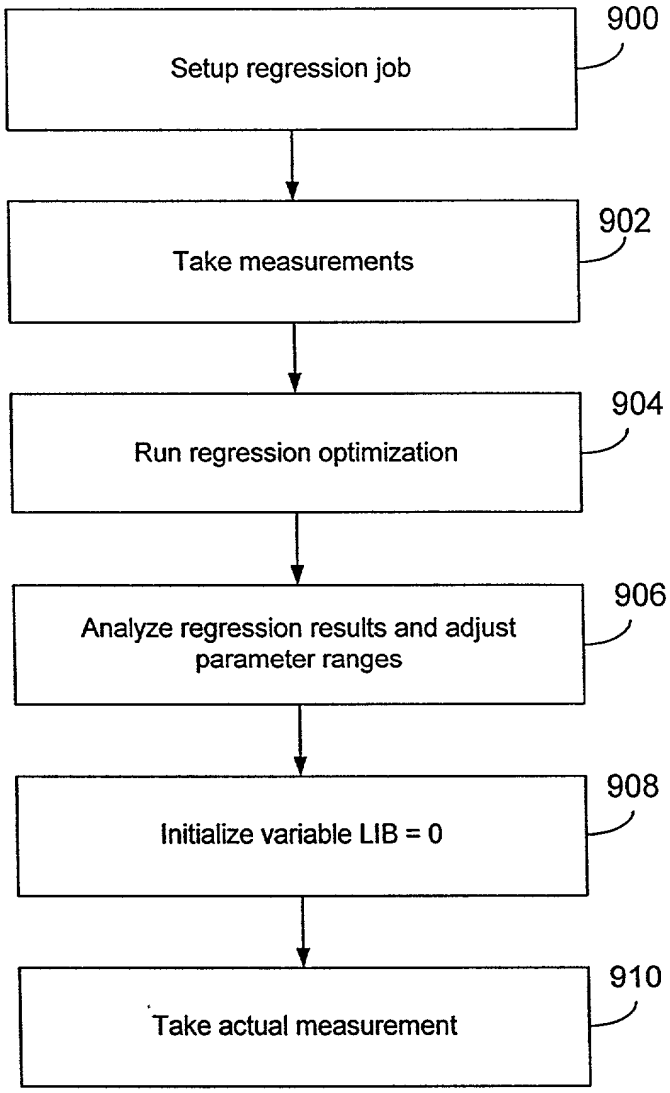
900
Setup regression job
902
Take measurements
904
Run regression optimization
906
Analyze regression results and adjust parameter ranges
908
Initialize variable LIB = 0
910
Take actual measurement

FIG. 9

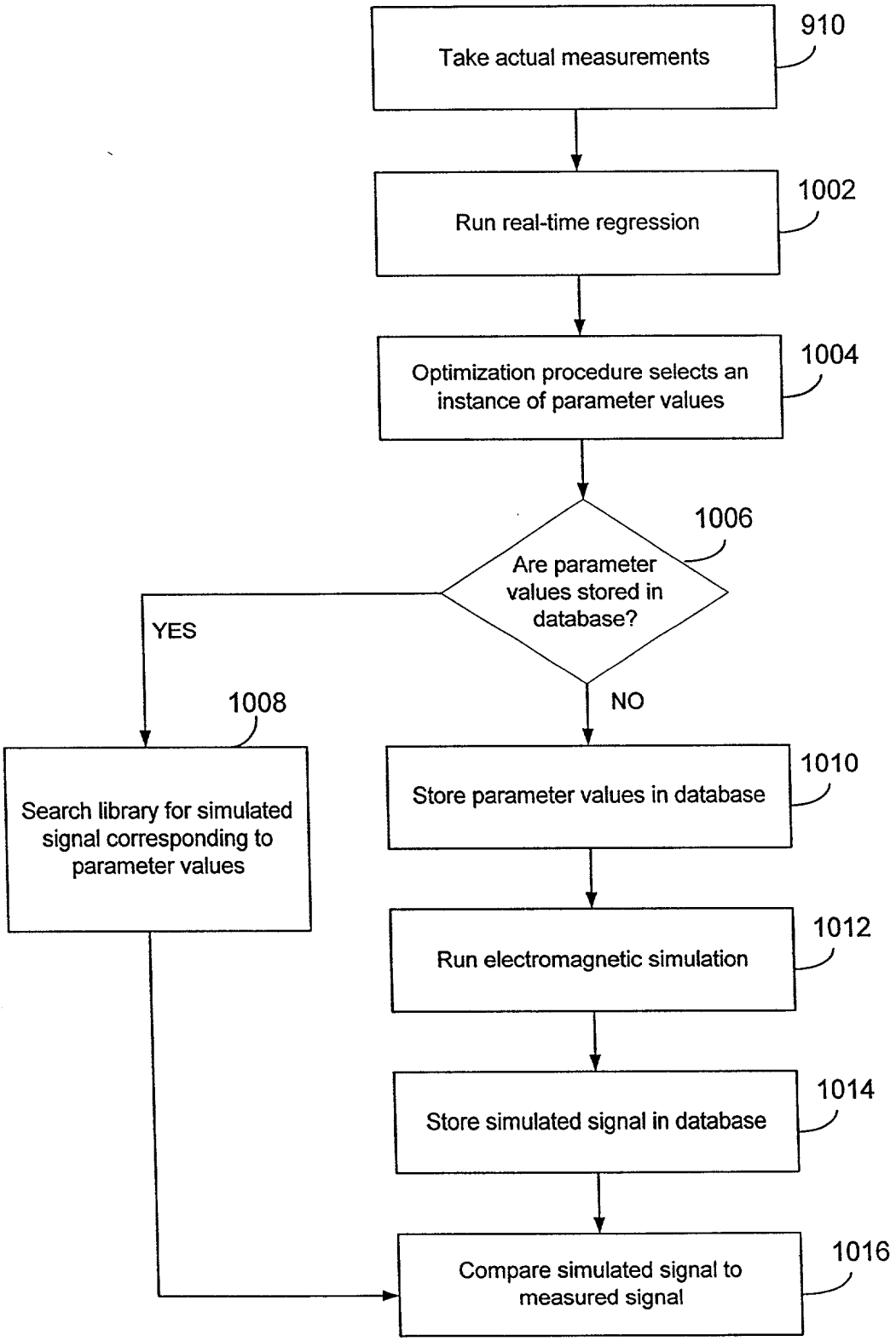
Take actual measurements
910
Run real-time regression
1002
Optimization procedure selects an instance of parameter values
1004
Are parameter values stored in database?
1006
YES
NO
1008
Search library for simulated signal corresponding to parameter values
Store parameter values in database
1010
Run electromagnetic simulation
1012
Store simulated signal in database
1014
Compare simulated signal to measured signal
1016

FIG. 10

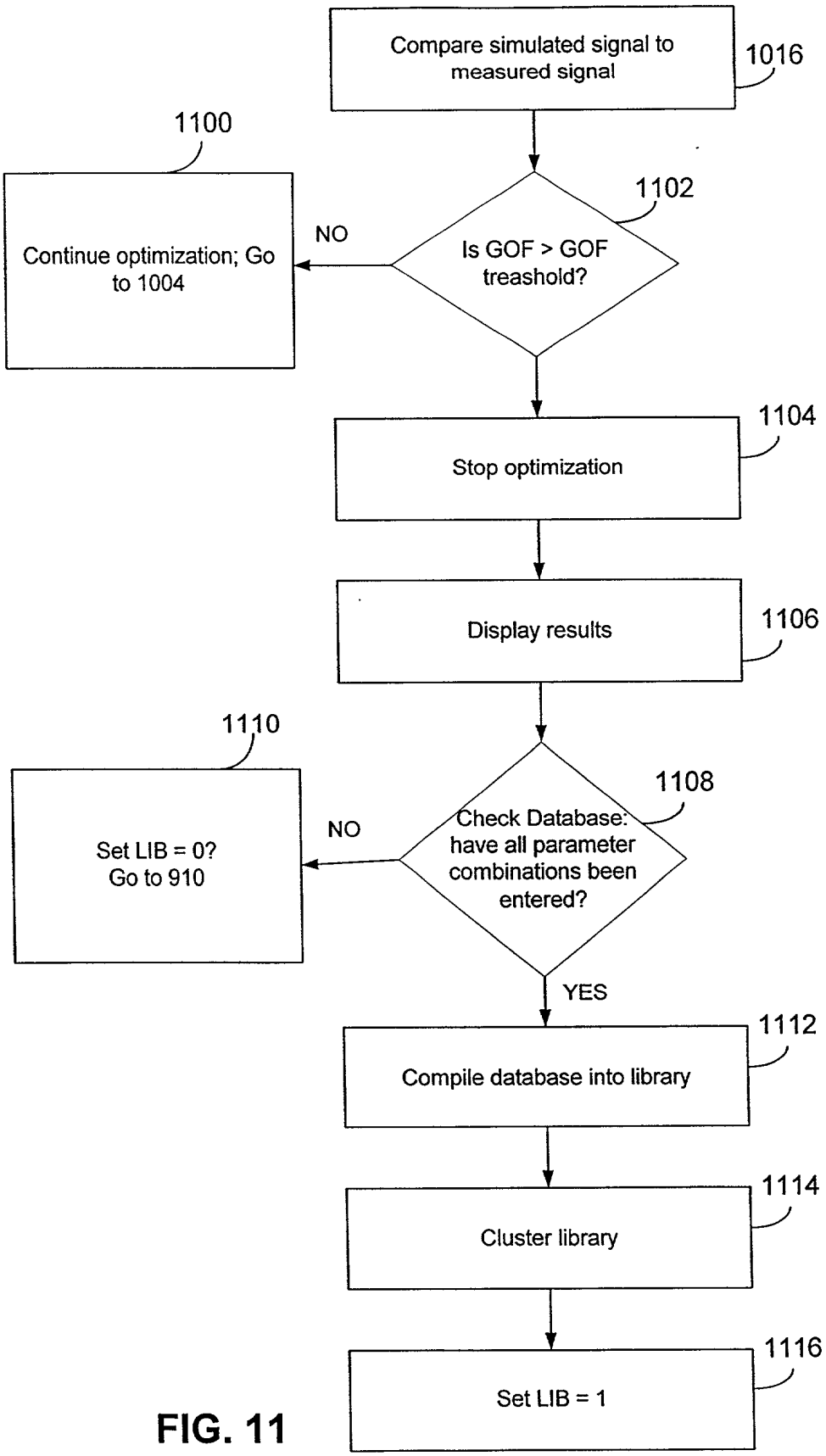
Compare simulated signal to measured signal
1016
1100
1102
NO
Continue optimization; Go to 1004
Is GOF > GOF treashold?
1104
Stop optimization
Display results
1106
1110
1108
Set LIB = 0? Go to 910
NO
Check Database: have all parameter combinations been entered?
YES
1112
Compile database into library
1114
Cluster library
1116
Set LIB = 1

FIG. 11

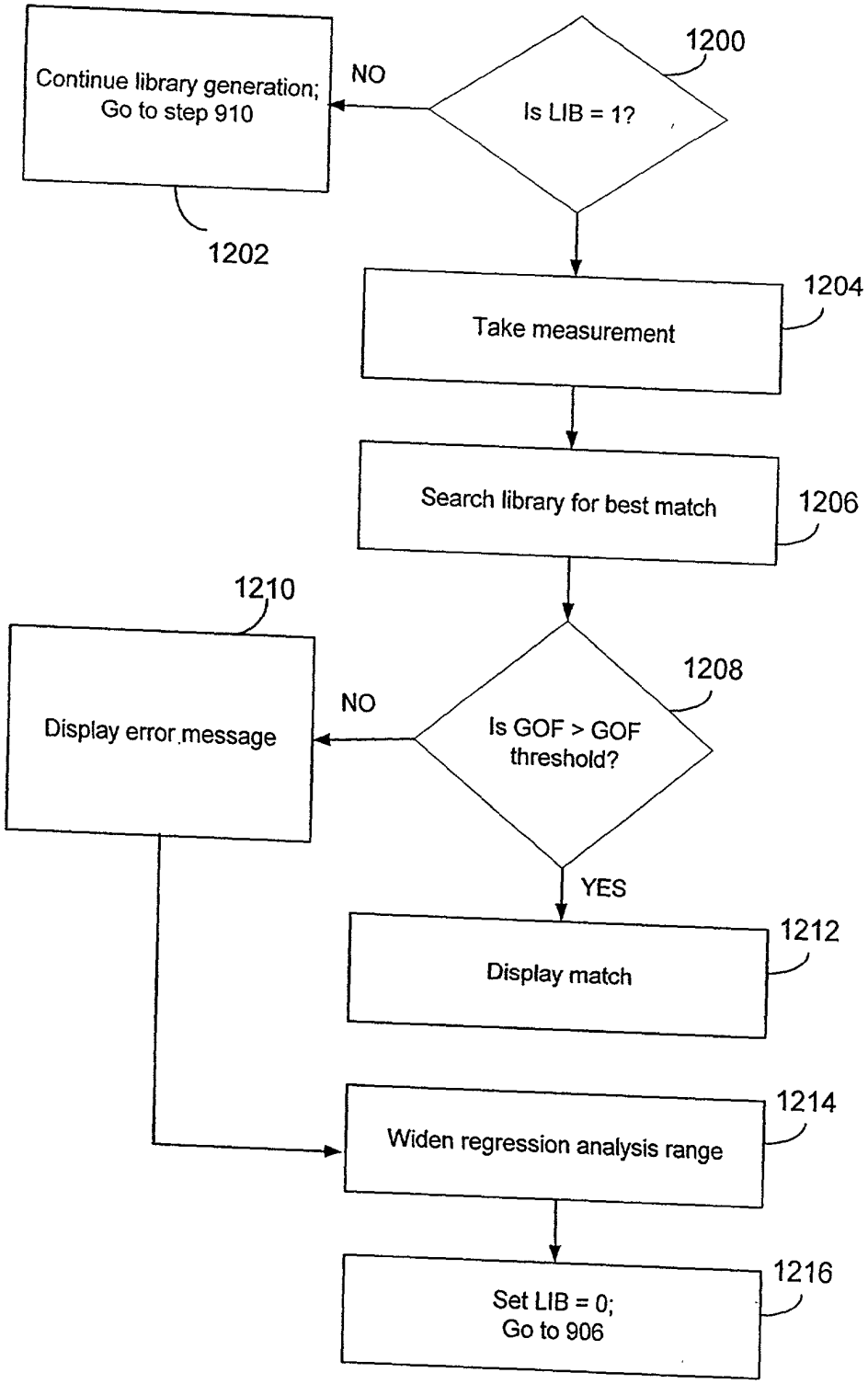
1200
Is LIB = 1?
NO
Continue library generation; Go to step 910
1202
1204
Take measurement
1206
Search library for best match
1208
Is GOF > GOF threshold?
NO
1210
Display error message
YES
1212
Display match
1214
Widen regression analysis range
1216
Set LIB = 0; Go to 906

FIG. 12

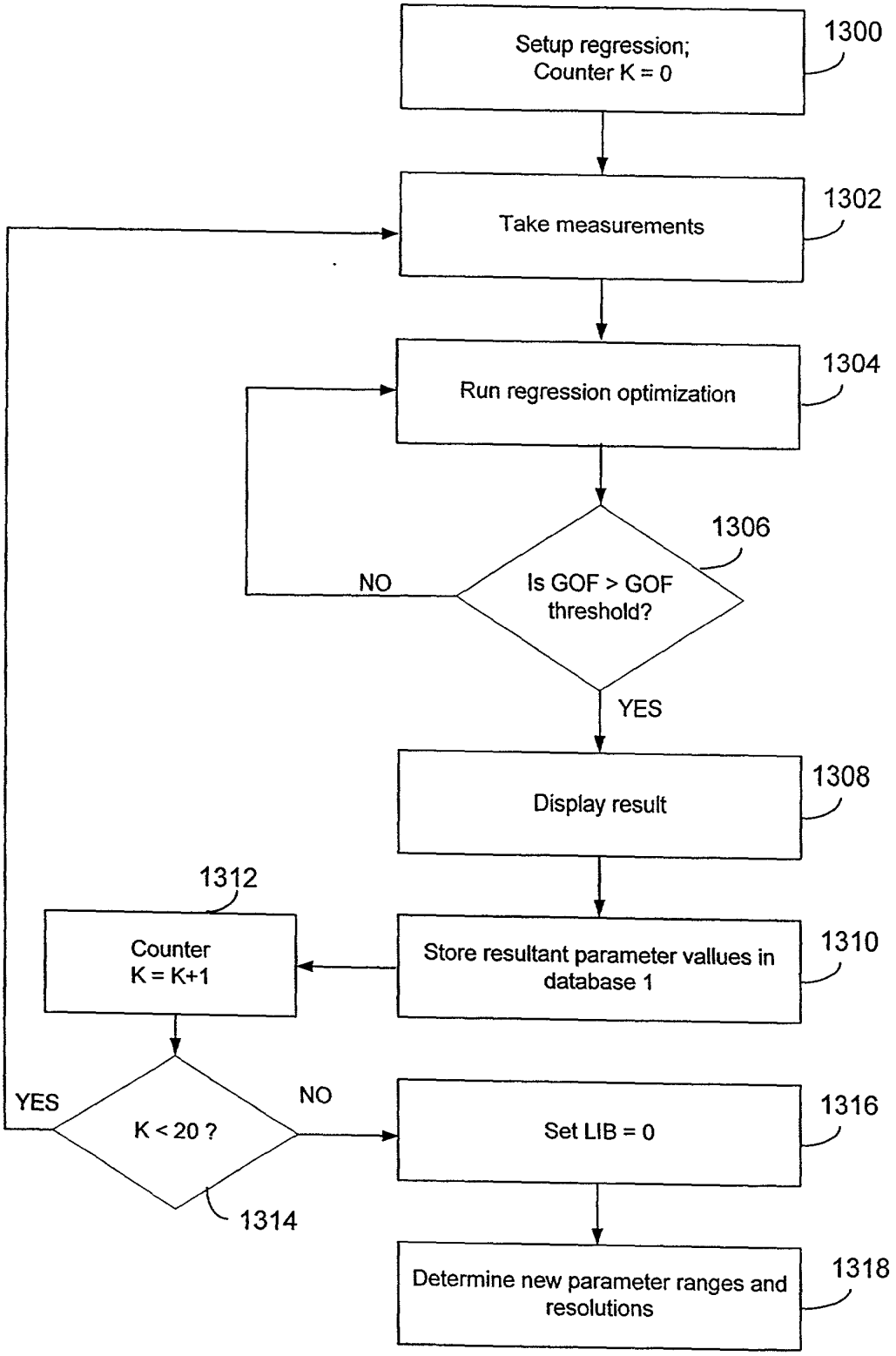
Setup regression;
Counter K = 0
1300
Take measurements
1302
Run regression optimization
1304
Is GOF > GOF threshold?
1306
NO
YES
Display result
1308
Store resultant parameter vallues in database 1
1310
Counter
K = K+1
1312
K < 20 ?
1314
YES
NO
Set LIB = 0
1316
Determine new parameter ranges and resolutions
1318

FIG. 13

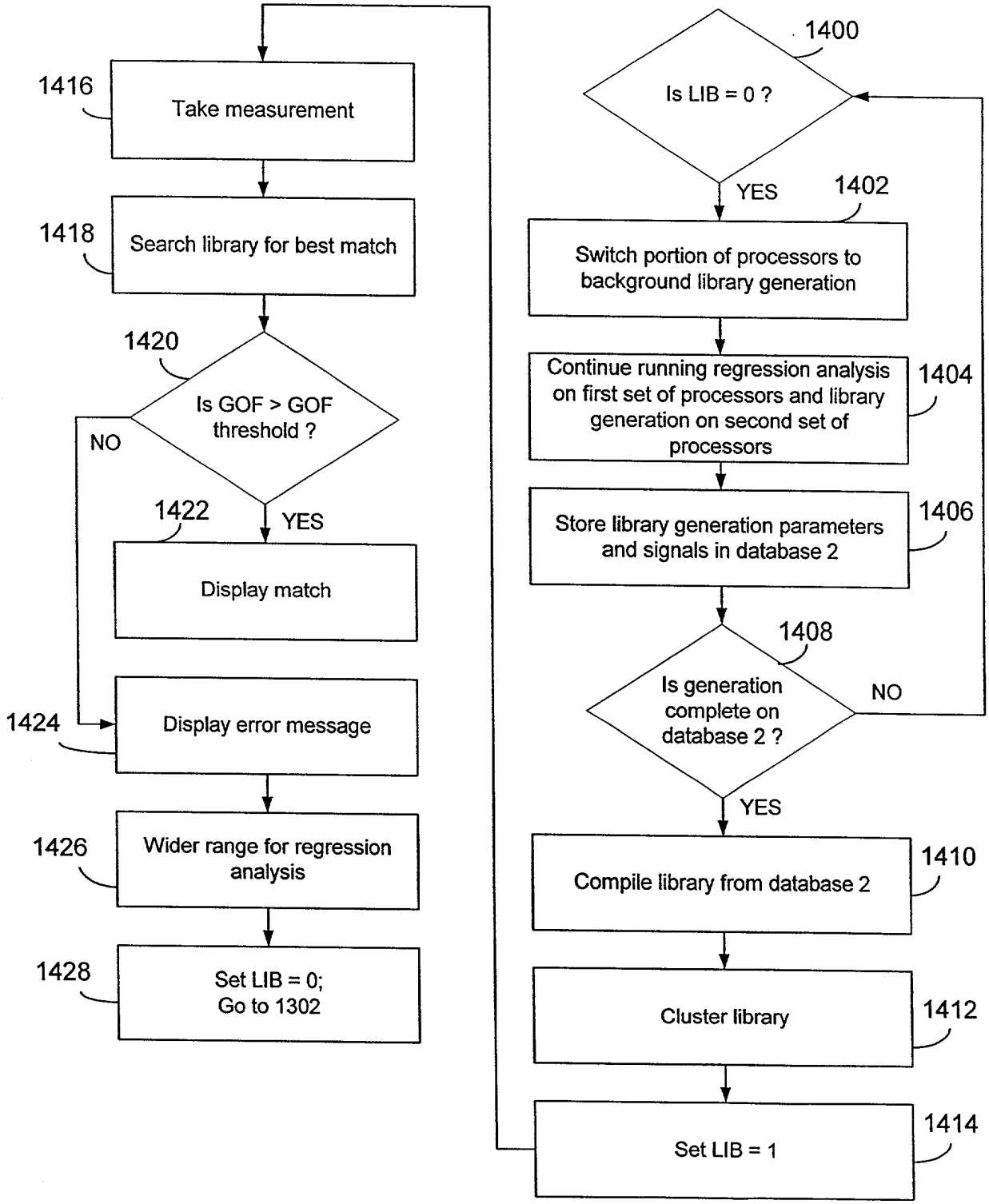
1400
Is LIB = 0 ?
YES
1402
Switch portion of processors to background library generation
Continue running regression analysis on first set of processors and library generation on second set of processors
1404
Store library generation parameters and signals in database 2
1406
1408
Is generation complete on database 2 ?
NO
YES
Compile library from database 2
1410
Cluster library
1412
Set LIB = 1
1414
1416
Take measurement
1418
Search library for best match
1420
Is GOF > GOF threshold ?
NO
YES
1422
Display match
1424
Display error message
1426
Wider range for regression analysis
1428
Set LIB = 0;
Go to 1302

FIG. 14